

APPROVAL PAGE

Document Title: **Maine Brownfields Quality Assurance Project Plan (QAPP)**

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1.0 Introduction

This Quality Assurance Project Plan (QAPP) has been developed by the Consultant, at the direction of the Maine Department of Environmental Protection (MEDEP), to meet the requirements of the United States Environmental Protection Agency (USEPA) and the MEDEP for environmental sampling and measurement efforts related to project sites in the MEDEP's Brownfields site assessment program. This QAPP, referred to as the *Project QAPP*, will be used by the Consultant for various projects that are part of MEDEP's Brownfields program. The purpose of this QAPP is to provide guidance for generating data that is of the precision, accuracy, and completeness necessary for the intended end use of the data.

A *Site-Specific QAPP* will be generated for each site that is included in the Brownfields site assessment program. The site-specific QAPP will follow the outline in Section 5 of this Project QAPP, and will describe the site-specific information including a project description, scope of work, data quality objectives, schedule, and budget for that site. Site-specific QAPPs will be used in conjunction with this Project QAPP and will reference the Project QAPP for data collection methods, laboratory methods, and data evaluation and assessment requirements. Unless otherwise stated, the term QAPP as used throughout this document will refer to the Project QAPP.

2.0 Quality Assurance Statement

This quality assurance project plan (QAPP) is a management tool for generating data that is of the precision, accuracy, and completeness necessary for the intended end use of the data. A key to being successful is having clear project objectives and a strong data quality objective (DQO) analysis.

3.0 Organization

This section summarizes the organizational structure for this project.

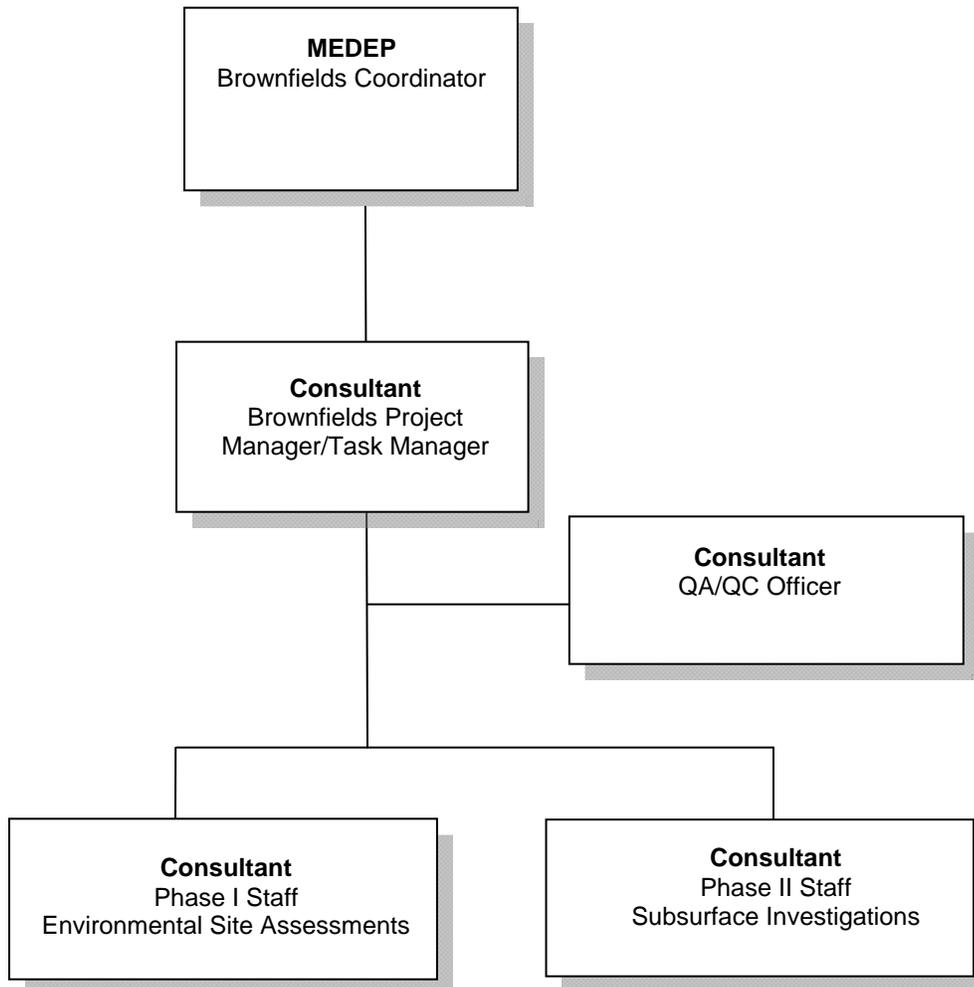
3.1 PROJECT ORGANIZATIONAL CHART

Figure 3-1 is a Project Organization Chart depicting the agencies and companies involved with this project. **Table 3-1** describes each participant's role in this project.

In addition to the roles outlined in Figure 3-1 and Table 3-1, the following subcontractors are anticipated: excavator operator, Geoprobe operator, and laboratory.

Table 3-1 Project Personnel Responsibilities			
Name	Title	Organizational Affiliation	Responsibilities
	EPA Project Manager	USEPA	Project oversight and approval.
	Brownfields Coordinator	MEDEP	Administers Brownfields grant. Provides technical oversight.
	Brownfields Project Manager	Consultant	Provides overall technical and project direction for the consultant.
	Task Manager/ Field Leader	Consultant	Day-to-day technical lead; oversees and coordinates data collection; participates in data interpretation and preparation of deliverables; communicates and coordinates with subcontractors.
	Quality Assurance Officer	Consultant	Develops project QA/QC objectives and implements checks for QAPP adherence.
Field Staff	Scientists/ Engineers	Consultant	Conduct field activities with oversight from Project Manager; oversee subcontractor field activities; communicate and coordinates with Project Manager.

Figure 3-1: Project Organization Chart



4.0 Data Quality Objectives

Data Quality Objectives (DQOs) are qualitative and quantitative statements that specify the quality and quantity of data needed to support decisions during site assessments. DQOs are developed by considering the *purpose* of collecting the data and the intended *use* of the data. For this project, the DQOs will establish the quality of data needed to meet the goal of the site assessments and the intended end use of the data. The DQOs will be site-specific and are discussed in Section 5 of this QAPP. A summary of data quality objectives is provided in **Table 4-1**. The media-specific criteria that may be used to evaluate the various types of data generated are presented in **Table 4-2**. The actual criteria used will be site-specific and will be included in the site-specific QAPP. Data quality assessments are discussed in Section 9 of this QAPP.

TABLE 4-1 SUMMARY OF DATA QUALITY OBJECTIVES					
Matrix	Parameters	Methods	Analytical Level¹	Data Evaluation Tier²	Intended Data Use³
Field Parameters					
Groundwater/ Surface Water	pH, Temperature, Conductivity, Turbidity, DO, ORP	On-site field measurements	Level I	NA	As appropriate to meet project goals
Soil	VOCs	Handheld PID Meter and/or portable field gas chromatograph with PID	Level I	NA	As appropriate to meet project goals
Groundwater/Soil	VOC	Field screened by Modified USEPA Method 8260 ⁴	Level I	Tier I	As appropriate to meet project goals
Soil	Inorganics	Field screened by XRF	Level I	Tier I	As appropriate to meet project goals
Off-Site Laboratory Analysis					
Groundwater; Surface Water; Soil; Sediment	VOCs	USEPA Method 8260B/5035	Level II	Modified Tier I	As appropriate to meet project goals
	SVOCs	USEPA Method 8270	Level II	Modified Tier I	
	Metals	USEPA Method SW846 – 7000 series	Level II	Modified Tier I	
	Pest/PCBs	USEPA Method 8081/8082	Level II	Modified Tier I	
	VOCs (Drinking Water)	USEPA Method 524.2	Level II	Modified Tier I	
	DRO/GRO	Methods 4.1.25 & 4.2.17 Methods 415.1 & Lloyd Kahn	Level II	Modified Tier I	
	TOC	Methods 335.4 & 9012A Mod.	Level I	Tier I	
	Cyanide		Level II	Modified Tier I	

NOTES:

- 1) Analytical levels (USEPA, October 1988):
Level I, on-site field screening and measurements, use one point calibration.
Level II analyses using standard laboratory QA/QC, including duplicate analyses, suitable calibration standards, sample preparation equipment, and operator training.
Level III analyses will be conducted in a fixed-based laboratory using standard methods that include duplicate, blank, and matrix spike/matrix spike duplicate analyses.
- 2) Tier levels for Region I, EPA-New England Data Validation Functional Guidelines for Evaluating Environmental Analyses (USEPA 1996). Modified Tier I is described in Section 9.2.2 of this QAPP.
- 3) Data Intended End Use is project-specific and may include: determine need for emergency action; identify waste material/contaminants; determine quantity and levels of contamination; identify impacted targets/receptors; develop site score; document need for further action or no further action.
- 4) If a modified USEPA method 8260 is used, the SOP for the analysis should be included in the site-specific QAPP.

Table 4-2: State Criteria for Evaluating Data

Medium	State Criteria for Evaluation
Surface Soil (0-2 ft bgs)	MEDEP RAGs
Subsurface Soil	SS
Surface Water	MEDEP SWQC
Sediment	SS
Groundwater	MEGs

ft bgs = feet below ground surface

MEDEP = Maine Department of Environmental Protection

RAGs = Remedial Action Guidelines

MEGs = Maximum Exposure Guidelines

SWQC = Statewide Water Quality Criteria

SS = will be site-specific and will be based on receptors and exposure pathway

5.0 Quality Assurance Project Plans (Site Specific)

A site-specific QAPP will be developed for each project site investigated by the Consultant as part of this Brownfields program. Data collection, analysis, and evaluation for each site will follow the guidance outlined in the Project QAPP. Site-specific QAPPs will include the following sections:

1.0 Title and Approval Page

This will include the document title and signature blocks for each person required to approve and sign the site-specific QAPP.

2.0 Project Organization and Responsibility Flow Chart

This section will include a brief description of how the project is organized, including identification of the key project personnel and their responsibilities and a flow chart showing the chain of command.

3.0 Scope of Work

The scope of work will include the following sections:

3.1 Project Description

This section will include a description of the project site, including site location, site history, past uses, suspected contamination locations, identification of suspected contaminants, media that may be affected, and the problem that the field investigation is designed to solve. A site location map will be included. If known, a description of the future land use of the project site will also be included.

3.2 Data Quality Objectives

This section will discuss the following: 1) the goal of the site assessment; 2) the end use of the data; and 3) the data quality that will be necessary for the project. The regulatory criteria (e.g., MEGs, RAGs) that will be used to evaluate the data will be included.

3.3 Site Conceptual Model

This section will include a description of the past uses of the site, geologic and hydrogeologic information, suspected types and sources of contaminants, migration pathways, and potential receptors.

3.4 Sampling Plan

This section will include the following:

- a detailed description of the work to be performed including identifying the media to be sampled, sampling locations, analyses to be performed (by media), and the rationale for sampling locations;
- a site map showing the sampling locations;
- an SOP reference table listing the field sampling SOPs that will be used for the project (Note: SOPs that will be used for the project that are not included in this Project QAPP will be attached as an appendix to the site-specific QAPP);
- a sampling and analytical methods requirements table that will show, by medium, the parameters to be analyzed, the number of samples to be collected, the analytical methods, a description of the sampling container and size, preservation requirements, and maximum holding times.

- a field quality control requirements table listing the types and frequency of collection of QC samples that will be collected in the field. This table will be specific as to the number of QC samples to be collected by matrix and parameter.

3.5 Schedule

This section will provide an overall project timeline for the work to be performed.

3.6 Budget

This section will provide the estimated budget to complete the proposed activities for the project.

6.0 Field Equipment

The Consultant owns field equipment that may be used for this project. The consultant may also rent field equipment from an equipment rental vendor for use on this project.

6.1 PREVENTATIVE MAINTENANCE - FIELD EQUIPMENT

Equipment, instruments, tools, gauges, and other items owned by the Consultant and requiring preventive maintenance will be serviced in accordance with the manufacturer's recommendations. It will be the responsibility of the operator to adhere to this maintenance schedule and to arrange for service as required. Service to the equipment, instruments, tools, gauges, etc. shall be performed by qualified personnel. Maintenance of field equipment from vendors is the responsibility of the vendors.

Maintenance records should be documented and traceable to the specific equipment, instruments, and tools. Critical spare parts will be stored for availability and use in order to reduce downtime. In the event that an instrument needs to be replaced during the field program, replacement equipment will be obtained either from the Consultant's equipment supply or from an equipment rental vendor, depending on availability.

6.2 CALIBRATION AND CORRECTIVE ACTION – FIELD EQUIPMENT

Field analytical equipment will be checked and calibrated, if required, in accordance with the procedures and frequency. The calibration procedures will conform to manufacturer's standard instructions and equipment will be calibrated to within the allowable tolerances established by the manufacturer. Records of instrument calibration will be maintained by field personnel.

7.0 Laboratory Services

It is anticipated that routine analytical services may be provided by more than one laboratory for this project.

The laboratory analytical levels (Level I, Level II, Level III, Level IV) for a project will be site-specific and will be indicated in the site-specific QAPP. At a minimum, the laboratory data packages will include the information listed in **Table 7-1** for the stated analytical level.

Table 7-1: Minimum Laboratory Data Package Elements by Analytical Level

Analytical Level	Elements Included in Laboratory Deliverable
Level I	<ul style="list-style-type: none"> • Report of Analysis (Form 1 or equiv -- TICs optional) • External chains of custody • Blank Results (organics) (Form 1 or equiv)
Level II	<ul style="list-style-type: none"> • Requirements for Level I, plus the following: • Surrogate Recoveries (Form 2 or equiv) • Laboratory Control Sample Recovery (Form 3 or equiv) • Dup/MS/MSD, if performed on client sample (Form 3) • Method Blank Summary(equiv) (Form 4)
Level III	<ul style="list-style-type: none"> • Requirements for Level II, plus the following: • Tune Summaries (Form 5) • Initial Calibration (Equiv.) Response Factor Report (Form 6) • Continuing Calibration Check (Equiv) (Form 7)
Level IV	<ul style="list-style-type: none"> • Requirements for Level III, plus raw data

8.0 Standard Operating Procedures

It may not be possible or appropriate to follow the SOPs exactly in all situations due to unique site conditions, equipment limitations, and limitations in the SOPs. In the event that SOPs cannot be followed, they may be used as general guidance and modifications to the SOPs will be documented in the site-specific work plan, the field book, or on field data sheets. In the event that an activity is performed that does not have a specific SOP, the procedures used will be noted in the field book or on field data sheets.

9.0 Data Quality Assessment

9.1 FIELD QUALITY CONTROL REQUIREMENTS

Quality control samples may include trip blanks, equipment blanks, and field duplicates/splits. These samples are used to evaluate analytical data usefulness as it pertains to sample representativeness and the potential of non-site related chemicals appearing in the analytical results.

The types and collection frequencies of the various QC samples are described in the following **Table 9-1**.

QC Sample	Frequency	Acceptance Criteria	Corrective Action
Field Duplicate	5% per parameter per matrix	Per EPA data evaluation guidelines for comparison of field duplicates	Compare to appropriate action level and determine need for resampling or reanalysis
VOA Trip Blank	1 per cooler containing VOC water samples	No compounds detected	Qualify results or resample if cross contamination is suspected
Equipment Blank	One per non-dedicated piece of equipment that comes in contact with sample medium per sampling event	No compounds detected	Qualify results or resample if cross contamination is suspected
Matrix Spike/Matrix Spike Duplicate	Based on site-specific matrix conditions	Meets criteria specified	Data will be qualified if relative percent difference criterion is not met

9.2 VERIFICATION AND VALIDATION REQUIREMENTS

This section provides a discussion of the type and extent of quality control evaluation that will be completed in conjunction with the analytical data collected at the Site. Results of this evaluation will be used to provide verification for reported sample concentrations.

9.2.1 Verification of Sampling Procedures

The following criteria will be used to evaluate the field sampling data:

- documentation of field equipment calibration activities;
- reviewing data for technical credibility vs. the sample site setting;
- auditing field sample data records and chain-of-custody; and
- auditing of sample handling and preservation procedures.

Sampling procedures will be evaluated by the Field Lead and/or the Project Manager as appropriate. The results of the evaluation will be included in the site-specific Phase II report, and resulting impacts to the data will be discussed.

9.2.2 Data Verification and Validation

Analytical data will be evaluated according to the tiers presented in Table 4-1, or as otherwise described in the site-specific QAPP. Data evaluation reports, in general accordance with EPA Region 1 Functional Guidelines, will be submitted with the Phase II ESA Report for each site. Deviations from the standard evaluation process, along with justification for why the changes were made, will be described in the Phase II ESA Report.

Tier I Evaluation

A Tier I validation process, if performed, will include a review of tabulated quality control results and comparison against EPA Region I validation limits and/or project specific criteria to identify bias or other interferences that could affect the quality of sample results. Specific quality control components to be evaluated in the Tier I review include the following:

- Data completeness check
- Holding times
- Sample preservation
- Blank results. The 5x and 10x rule will be used to qualify sample concentrations that have detections in associated blanks.

Modified Tier I Evaluation

A Modified Tier I evaluation will include the components of the Tier 1 evaluation, plus the following:

- Surrogate recoveries
- Matrix spike and matrix spike duplicate results
- Field duplicates
- Laboratory control sample results

Tier II Evaluation

If, during data evaluation, significant problems with data are encountered, then a Tier II validation process may be performed. Specific quality control components to be evaluated in the Tier II review include everything from the Modified Tier 1 review plus the following:

- Initial and continuing calibration results
- Internal standard results
- GC/MS tuning results
- Interelement interferences on metals concentrations
- Serial dilution results

Data Qualifiers

Based on validation results, qualifiers will be added to reported analyte concentrations to indicate uncertainty or potential bias or interferences. Specific data qualifiers which will be applied to organic sample concentration include the following:

- U - The analyte was not detected above the practical quantitation limit.

- J - The analyte was detected but the associated reported concentration is approximate and is considered estimated.
- R - The reported analyte concentration is rejected due to serious deficiencies with associated quality control results. The presence or absence of the analyte cannot be confirmed.
- UJ - The analyte was not detected above the PQL. However, due to quality control results that did not meet acceptance criteria, the quantitation limit is uncertain and may not accurately represent the actual limit.

9.3 DATA USABILITY

The measurement performance criteria will depend on the stated DQOs for each project. Depending on the required data quality, any or all of the following considerations for precision, accuracy, and completeness may be evaluated. To meet these requirements, quality control criteria are provided in the standard laboratory methodologies. These criteria include the use of field duplicates and matrix spike samples to assess precision, matrix spikes, laboratory control samples and calibration results to assess accuracy; blank samples to determine representativeness; field duplicates to assess comparability. The amount (percentage) of valid data obtained from validation will be used to determine completeness. The results of the data usability evaluation will be included in the site-specific Phase II Report, and impacts and/or limitations on the use of the data will be discussed.

9.3.1 Precision

Precision is a measure of the mutual agreement between concentrations of samples (e.g., duplicates) collected at the same time from the same location. Precision is measured by performing duplicate measurements in the field or laboratory. Precision is expressed in terms of Relative Percent Difference (RPD) using the following equation:

$$RPD = [(C1-C2)/(C1+C2)/2] \times 100$$

where:

C1 = The larger of the two concentrations.

C2 = The smaller of the two concentrations.

Laboratory precision will be evaluated using EPA Region I tier evaluation criteria or method specific criteria. In the absence of EPA guidelines, acceptance criteria for analytical precision will be based on the fixed based laboratory's QA/QC program.

Acceptable levels of precision will vary according to the sample matrix, the specific analytical methods, and the analyte concentration relative to the method detection limit (MDL). Quality assurance objectives for precision will be met through the use of written laboratory standard operating procedures (SOPs) in which data acceptance criteria will be outlined.

9.3.2 Accuracy

Accuracy is the degree of agreement of a measurement with an accepted reference or true value. The difference between the values is generally expressed as a percentage or ratio. Through quality control checks for accuracy, potential bias of reported sample concentrations is identified. Accuracy of field instrumentation is assured by daily initial calibration and calibration checks. The accuracy of laboratory

analytical procedures are measured through a review of calibration, matrix spike and laboratory control sample results.

Continuing calibration accuracy checks are assessed by comparing the true value against the reported concentration. The percent difference between the results is calculated as follows:

Accuracy may be expressed as a percent difference (%D) calculated by the following equation:

$$\%D = (V_t - V_m)/V_t \times 100$$

Where:

V_t = the true or real value expected.

V_m = the measured or observed value.

The degree of accuracy demonstrated for laboratory control and matrix spike samples is expressed as a percent recovery. The percent recovery indicates the amount of known concentration of an analyte that has been detected by the associated instrumentation. The percent recovery (%R) is calculated as follows:

$$\%R = (SSR - SR)/SA \times 100$$

Where:

SSR = the spiked sample result.

SR = the unspiked sample result.

SA = the value of the spike added.

The objective for field measurement accuracy initially is to successfully calibrate the associated instrumentation to the manufacturer's specifications and to then check the amount of deviation from the calibrated values at the end of day. The objective for accuracy of laboratory determinations is to demonstrate that the analytical instrumentation provides consistent measurements, which are within EPA and statistically-derived method-specific accuracy criteria.

9.3.3 Completeness

Completeness is a measure (percentage) of the amount of valid data obtained from a measurement system relative to the amount that would be expected to be obtained under correct, normal conditions. Valid data will be defined by the successful attainment of the Data Quality Objectives as specified in this QAPP.

$$\text{Completeness (A\%)} = \frac{\text{\# of valid values reported for a parameter} \times 100}{\text{\# of samples collected for analysis for that particular parameter}}$$

A% = Acceptance Percentage

The QA objective for completeness will be optimized by employing and evaluating frequent quality control checks throughout the analytical process so that sample data can be assessed for validity of results and to allow for reanalysis within the hold time when problems are indicated by the QC results.

A completeness of at least 85% is acceptable. The EPA document 'Data Quality Objectives for Remedial Response Activities' states that Contract Laboratory Program data have been found to be historically 80-85% complete.

9.3.4 Representativeness

Sample representativeness will be assessed through an analysis of the blank results. The concentrations and frequencies of target analytes detected in blanks will provide an indication of data representativeness. The 5X and 10X rules (USEPA, 1996) will be used to eliminate potential false positive results indicated by the blank data. The data usability assessment will describe issues concerning representativeness based on a review of these data.

Sample representativeness will also be assessed through an evaluation of the sample results with the sampling design (locations and conceptual site model) to determine if the results are representative of the environment from which the samples were collected.

9.3.5 Sensitivity

Sensitivity will be evaluated for key contaminants of concern that have practical quantitation limits near the standard/criteria being used to evaluate the data. An evaluation of the sensitivity of the data will be included in the data usability assessment.

9.4 REFERENCES

U.S. Environmental Protection Agency (USEPA) Region 1, 1996. "Region 1, USEPA - New England Data Validation Functional Guidelines for Evaluating Environmental Analyses." December 1996.

U.S. Environmental Protection Agency (USEPA) Region 1, 1989. "Region 1 Laboratory Data Validation, Functional Guidelines for Evaluating Inorganic Analyses." June 13, 1988, modified February 1989.

U.S. Environmental Protection Agency (USEPA), Region 1, 1996. "Region 1, USEPA – SOP No. GW 0001, Low Flow Purging and Sampling Procedure for Collection of Water Samples from Monitoring Wells." July 30, 1996.

10.0 Project Reporting

Table 10-1 provides a summary of the reports that will be completed for this project. The following briefly describes the content to be included in each of the reports.

10.1 VERBAL STATUS REPORTS

Verbal Status Reports will be given by field personnel to the Field Lead or Project Manager. The status reports will include a description of the field activities completed for the day, the personnel who completed each activity, the anticipated activities to be completed during the next day of field work.

10.2 TRIP REPORT

A trip report will be prepared following completion of field activities at each project site. The trip report will include copies of the Consultant's field notes and field data sheets. Trip reports will be prepared in general accordance with SOP S11, *Documentation of Field Notes and Development of a Sampling Event Trip Report*, SOP: DR# 013.

10.3 PHASE II ENVIRONMENTAL ASSESSMENT REPORT

A Phase II ESA Report will be prepared following completion of investigation and sampling activities at each project site. The Phase II report will generally follow the ASTM standard for Phase II environmental site assessment reports (See SOP S20, *Standard Guide for Environmental Site Assessments: Phase II Environmental Site Assessment Process; ASTM Designation E1903-97.*) and will document in writing the project activities that have been completed for each project. Laboratory analytical results will be presented, along with a data evaluation report.

10.4 DATA EVALUATION REPORT

The Data Evaluation Report will present the findings of the data evaluation processes. Resulting data quality and conformance with evaluation guidelines will be presented.

Table 10-1 Project Reports				
Type of Report	Frequency	Projected Delivery Date(s)	Person(s) Responsible for Report Preparation, Title and Organizational Affiliation	Report Recipients, Title and Organizational Affiliation
Verbal Status Reports	Daily during field activities	At the end of every day of field activities	Field Sampling Personnel, Consultant	Task Manager, Consultant
Trip Report	One per project site	Following completion of Phase II field work	Brownfields Project Manager, Consultant / Field Sampling Personnel, Consultant	Brownfields Coordinator, MEDEP
Phase II ESA Report	One per project site	Following completion of Phase II field work and receipt of analytical results	Brownfields Project Manager, Consultant	Project Manager, USEPA Brownfields Coordinator, MEDEP Local Municipal Official (site-specific) Task Manager, Consultant
Data Evaluation Report	After all data from a sampling event is generated and validated	Included with the Phase II ESA Report	Data Validator, Consultant or other data validator	Brownfields Coordinator, MEDEP Local Municipal Official (site-specific) Brownfields Project Manager, Consultant Task Manager, Consultant

11.0 Document Control

This section describes how field and laboratory personnel will handle and track the samples collected and analyzed as part of this project.

11.1 SAMPLE COLLECTION DOCUMENTATION

The following sections outline procedures that will be used by field and laboratory personnel to document project activities and sample collection procedures.

11.1.1 Field Notes

Documentation of field observations will be recorded using a field logbook or on field sampling sheets. (*Refer to MEDEP SOP S11 "Documentation of Field Notes and Development of a Sampling Event Trip Report".*) Field sampling sheets or field logbooks will be used to document sample collection activities. An example of a field data monitoring sheet is provided in *SOP S18, SOP for Collection of Groundwater Samples from Temporary Geoprobe Well Points, Exhibit A.*

For sampling and field activities, the following types of information should be included if appropriate:

- project name
- date
- time of log book entries
- personnel
- weather conditions
- activities involved with the sampling
- site observations
- site sketches

11.1.2 Field Documentation Management System

The original field sampling sheets will be maintained on-site during the field event. After the field program is completed, the field sampling sheets will be filed in project files.

11.2 SAMPLE HANDLING AND TRACKING SYSTEM

This section outlines the procedures that will be followed to identify and track samples taken during field activities.

11.2.1 Sample Identification

Existing monitoring wells or sampling locations, if present, will retain their existing nomenclature (i.e., MW-2B, etc.). New wells or locations used by the Consultant will adhere to the following abbreviations by medium:

MW	= Monitoring Well (groundwater)
SB	= Soil Boring (soil)
SD	= Sediment
SS	= Surface Soil
GP	= Geoprobe (groundwater)
TP	= Test Pit (soil)
SW	= Surface Water
PW	= Pore Water

11.2.2 QA/QC

Quality Assurance/Quality Control (QA/QC) sample abbreviations may consist of the following:

DUP	= Duplicate Sample
MS	= Matrix Spike
MSD	= Matrix Spike Duplicate
TB	= Trip Blank or Temperature Blank
EB	= Equipment Blank

The DUP, MS, and MSD abbreviations will follow the specific sample identification. For example, a duplicate sample for monitoring well number 1S will be designated as "MW-1S DUP."

Trip blanks and equipment blanks will be numbered consecutively throughout each sampling event. The first trip blank used in the sampling event will be trip blank number 1, or "TB-1," and the second trip blank will be called "TB-2," and so forth. Likewise, equipment blanks will be numbered consecutively (EB-1, for example).

11.2.3 Sample Handling

Samples will be stored on-site in coolers packed with ice until they are sent to the laboratory for analysis. Bottles will be packed snugly with packing materials to protect the containers from breakage. Ice will be added to the cooler, and the Chain of Custody (COC) Form will be placed in the cooler prior to shipment. Samples will be placed in the coolers directly after sampling to prevent overexposure to sunlight and to keep them cool for preservation. Field personnel will be responsible for the security of the samples before they are shipped. Coolers and samples will be stored in a secure or monitored area on-site until they are shipped to the laboratory.

Samples will either be shipped by overnight courier (e.g., Federal Express) or transported by vehicle to the laboratory for analysis. All coolers shipped to the laboratory will be sealed with a COC seal that has been signed and dated. In general, samples will be shipped or transported within twenty-four hours of collection. Regardless of the shipping schedule, holding times begin with sample collection.

The person responsible for sample collection will notify the laboratory of the number, type, and shipment dates for the samples. If the number, type of date of shipment changes due to site constraints or program changes, the field leader will notify the laboratory of the changes. This notification will also occur when sample shipments are expected to arrive at the laboratory on Saturday. If prompt shipping and laboratory receipt of the samples cannot be guaranteed (i.e., Sunday arrival), the samplers will be responsible for proper storage of the samples until adequate transportation arrangements can be made.

11.2.4 Sample Labeling

Each sample container will be affixed with a self-sticking, waterproof, adhesive label. Each label shall be completed with a pen of indelible ink and contain the following information:

- Client Name: Consultant
- Site Name: "Site Name" for the particular sampling event
- Client Sample ID: SD-30, for example
- Date collected: (month/day/year)
- Sample Time given as military time (for example: 1400)
- Name/Initials of Collector: Consultant's Field Sampler
- Preservative
- Analytical method/analyte request (for example, VOCs -- 8260)
- Preservative: (for example - None, HNO₃, H₂SO₄, NaOH, HCl, Na₂S₂O₃, or Other).

11.3 SAMPLE CUSTODY

Sample custody will be designed to assure that each sample is accounted for at all times. (*Refer to SOP S10 "Chain of Custody Protocol".*) To maintain this level of sample monitoring, sample container labels and shipping manifests will be employed. A COC must be completed by the appropriate sampling and laboratory personnel for each sample. The objective of the sample custody identification and control system will be to assure that:

- samples scheduled for collection are uniquely identified;
- the correct samples are analyzed and are traceable to their records;
- samples are protected from loss, damage, or tampering;
- alteration of samples (e.g., filtration, preservation) is documented; and
- a forensic record of sample integrity is established.

The COC protocol followed by the sampling crews involves:

- Documenting procedures and amounts of reagents or supplies (e.g., filters).
- Recording sampling locations, sample bottle identification, and specific sample acquisition measures on the appropriate forms.
- Using sample labels to document information necessary for effective sample tracking.
- Completing COC to establish sample custody in the field before sample shipment.

When coolers are packed and sealed for shipping, the sampling person responsible for relinquishing the cooler to the courier will sign the COC Form and the COC cooler seal.

The COC record will be used to:

- document sample handling procedures including sample location, sample number and number of containers corresponding to each sample number;
- document the sample matrix; and
- document the COC process.

The COC form includes:

- sample number and sample bottle identification number, where applicable;
- names of the sampler(s) and the person shipping the samples and documented;
- purchase order number, if applicable;
- name, telephone number, and fax number of the contact person from the Consultant.
- project name;
- signature of the sampler;
- date and time that the samples were collected;
- names of those responsible for receiving the samples and the date and time received at the laboratory;
- matrix of the sample;
- the number of containers for a particular sample; and
- analysis, container type, and preservative information.

Corrections to a COC will be made by putting one line through the incorrect entry and initialing and dating it.

The COC record will accompany the samples to the laboratory and a copy of the COC will be retained by the sampler. The project manager will be responsible for maintaining a copy of the COC in the project file. The COCs will be supplied by the fixed laboratory with the standard data package.

11.4 FIELD DATA RECORDS

Measurements that will be collected in the field (including field parameters, such as pH, conductivity, and other parameters monitored as part of field activities) will consist of discrete readings and therefore will not include a data package deliverable. Readings will be recorded on field sampling sheets or in the field logbook for each task. These documents will be stored in MEDEP project files. (*Refer to SOP S11 "Documentation of Field Notes and Development of a Sampling Event Trip Report".*)